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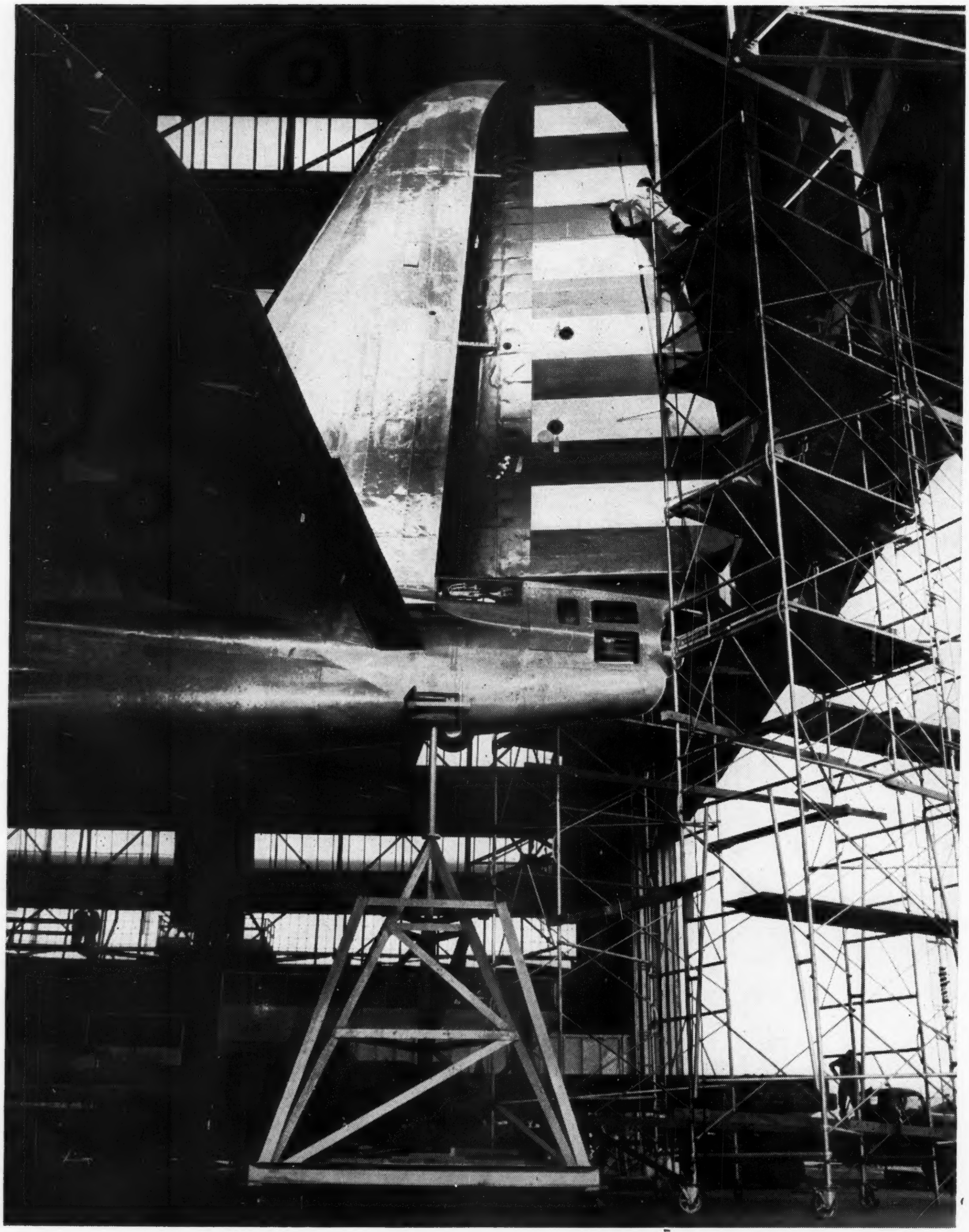


—Courtesy Ewing Galloway and Mechanical Engineering

Modern bomber plants present unusual construction problems

The Young Engineer in the War Effort

By SIDNEY DAVIDSON, M.E. '36

ENGINEERS are being called upon today primarily for their ability to contribute to the war effort. The present situation for the individual in one fundamental respect is no different now than it was in times of peace. Essentially it is finding and doing that job, whether in uniform or out, which one can do best. Obviously, in these perilous times, any delay on the part of young engineers in getting to do the work they can do best, should be minimized. Therefore, wherever possible they should begin early in their college careers to try to understand the industry they wish to enter and to learn as much as they can about its employment opportunities. To illustrate, let us consider a typical defense industry such as building construction, important because before armies could be mustered out, cantonments had to be built; and before the production of huge quantities of war materials could be started, properly equipped buildings had to be built.

The building construction industry has much to offer in the way of interesting and responsible employment and the manner in which one may possibly fit into such work can best be gathered from an outline of the industry. There are three principle divisions in this industry. The planners, as represented by the architects and the consulting engineers, the contractors, who actually buy the materials and employ the labor to do the building, and the manufacturers who produce and supply the materials.

Let us start by discussing the planners. It all begins when an owner engages an architect to design a building within a financial limit to suit the owner's needs, and yet give it a harmonious and pleasing appearance. However, a building must be given strength and utility too. This is the work of the engineer. For strength in the building the architect turns to the civil (structural) engineer to design the structural members to withstand the anticipated loads. For utility of the structure he turns to those engineers who are competent to design, select, and specify the mechanical and electrical equipment and systems of buildings. All such engineers are called consulting engineers, and in considering the design and installation of such equipment they have to discuss the space requirements and structural supports for their equipment with the architect and the consulting structural engineer. In this manner a building is roughed out and the plans started.

Typical of the way in which one can enter into construction work is the experience of the writer who, following his graduation, sought to make air conditioning his career. His first job was with a consulting engineer in New York City as a draftsman. When he was hired, the title "consulting engineer" was still very vague to him and being a draftsman seemed to be getting off on the wrong foot. In a few days, however, he got to understand what was happening in this office. He found that he was indicating on the drawings of a new department store building, remote from New York City, the locations and sizes of air conditioning ducts and equipment. He also had to indicate by symbols the locations of radiators and steam lines, and then the plumbing, water and sprinkler lines. At the same time there were other draftsmen indicating light fixture locations and wire runs, signal and telephone systems, electric feeders and panels. Still others were designing elevator, escalator and conveyor systems and another group was concerning itself with the boiler and power plant. This was amazing for this vast amount of engineering knowledge, involving everything mechanical and electrical that went to make the building usuable and habitable, was being prepared under the direction of one man, the consulting engineer. Besides being quite human, he was a recognized professional engineer with considerable experience in these fields. In this

THE AUTHOR

SIDNEY Davidson entered Sibley College in 1932. He won two scholarships, the Cornell State Scholarship and the John McMullen Scholarship. While at Cornell he was active in several extra-curricular engineering activities including the CORNELL ENGINEER.

Since graduation he has had broad experience working as draftsman designer, estimator, pricer, and trouble-shooter in several small engineering and air-conditioning concerns in New York and Washington.

Since graduating from Cornell Mr. Davidson has been a member of the Cornell Society of Engineers and is also a member if the American Society of Mechanical Engineers.

little interval the entire purpose of the consulting engineering profession became clear. It was realized that these plans were being prepared thusly for the architect who employed the engineer. This is the manner in which the architect "consults" with the engineer.

The young engineer thus fortunate enough to get into such an office, and regardless of how poor a draftsman he may be at the start, soon realizes what a tremendous field has opened up before him and that air conditioning to these people is just one of many building trades to be mastered. Quickly, he learns to represent things simply and clearly, to make the necessary calculations and to select, size, and specify equipment with the aid of manufacturers' catalogues. The quiet of an office is the best place for the young engineer to consolidate his education for it is here that the planning end is accomplished and it requires the development of an ability to visualize actual conditions and to properly represent them on drawings in accordance with good, substantial, theoretical, engineering practice. At the same time, some of his classmates, who may have gone through training courses with manufacturers, now come into contact with the consulting engineer at his office as company representatives or sales engineers in the discussion of equipment to be used and specified.

But how does this relate to the building of a bomber plant, an army or navy base, or a factory to employ thousands of newly trained workers to turn out the weapons of war or the goods of peace? Well, it is just an idea of the thought and effort that must be expended and put down on paper before the first shovel of earth can be turned.

The Actual Construction

But then, this too is only the curtain raiser to the adventure of actually working on the building construction itself. In this the work is more vigorous and exciting for it has constantly to do with men, materials, conditions of labor and the practical way of doing things. Based upon one's education and experience, one soon learns to make engineering allowances where necessary. Also, it is a life of movement to wherever the job may be and much of the work is out-of-doors. Actual construction is the best thing for the young engineer to turn to after he has gotten some experience in an office.

Besides the preparation of plans and specifications, however, the architect and engineer must get the building constructed. To do so construction companies, known as general contractors, or as contractor-engineers, are invited to bid upon the necessary work as per plans and specifications. Usually the lowest reputable bidder is awarded the contract and thereupon goes into play another vast amount of engineering and architectural talent. Now it is necessary to gather and assemble men and equipment, to estimate the quantities of materials required, and finally to purchase and assure its delivery to the proper place in the proper amount and at the proper time. To accomplish this, materials and equipment and their sources must be evaluated for the greatest resulting economy. Records of cost and progress must be maintained, and the full intent of the plans and specifications must be understood and made into a reality. Much of this is the engineer's work and frequently he is called upon to do many of these things alone.

In those cases, which frequently occur, where the general contractor is not set up to do all of the trades in the building, he subcontracts

This huge airplane plant was built around an existing factory without interrupting production.
—Courtesy Architectural Forum

this work to other more specialized contractors, but retains supervision over such work through an engineer in his employ. Thus a heating contractor will be engaged to do all of the heating, ventilating, and air conditioning work; a plumbing contractor will do all of the plumbing, water and sprinkler work; and just as the general contractor has engineers in his organization to perform the above mentioned functions so must the subcontractor have them too.

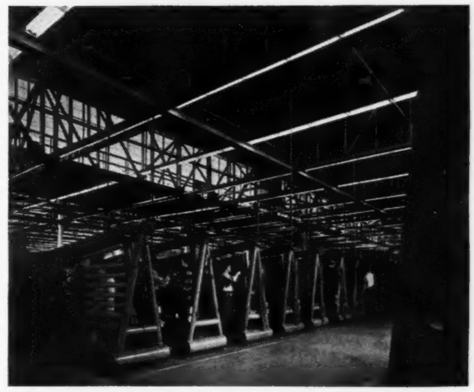
In all this work the need for the engineer's skill as a draftsman is still great, for it is now necessary for both the general contractor and the subcontractors to submit for the architect's approval shop and working drawings of every detail of the equipment, materials and methods of construction before work can proceed. To assure that work then proceeds in accordance with these drawings and to rectify any discrepancies that may have crept into the plans or were created by job conditions, every responsible architect and consulting engineer, contractor and subcontractor maintains his engineers and construction men in constant contact with the job and owners, to supervise and check the work as it is performed. This is the interesting job of co-ordinating one's work with that of the other trades on the job and also being the job representative of one's company to the owners and general contractor.

Prefer Young Engineers

Many companies like to put young engineers in the field in charge of work like this because at times it grows hectic and they find that young men can give and take the rough going much better and aren't bound by ultra-conservative practices and prejudices that one or two bad experiences may have brought to older men. This is especially true now because of shortages of materials prevent things from being done in the good, old-fashioned way, and the young engineer with a still unbiased mind is more likely to quickly pick up and adopt satisfactory substitutes and get the job done.

Here then, the young engineer has before him an outline of the infinite variety of opportunities to suit every mood and taste that his education so painstakingly prepares him for. Here too, is the overall picture and understanding of the business world that practically all students will have to face, for the set-up thus outlined is typical of any business or industry where planning is followed by production of construction. Present prominent examples are army and navy bases and establishments, airplane manufacturing, shipbuilding, armament production, bridge and road building and petroleum products.

Portions of Airplane Plant



—Courtesy Architectural Forum

There is much that the young engineer, while yet a student, can do to help himself get started early in this respect. He can visit and inspect plants and projects at every opportunity, and obtain work in them during vacations. The faculty and college, although heavily overburdened already, not only can assist the student to one or both of the above, but by weaving into the entire curriculum an understanding of the business world the students are to face, they will do much to make the young engineer's contribution to the war effort start long before he graduates.

In regard to the types of employment now available, the writer has this to offer from his personal experiences. A good, small company is better to start out in than a large one, for it is easier to assume and retain responsible work of a broad, all-around nature that will always stand one in good stead wherever he may go. Such opportunities may be found with big companies too, but not as frequently. The interesting part of working with big companies is the size of the jobs they can take on. At times it is breath-taking but in the final analysis, it is broken down into a group of small, co-ordinated jobs. Working in the civil service for the government, the writer found that the call upon his education and experience was very meager and lacked the vigor and opportunity of private employment. In regard to additional education after leaving college, the writer found that as a mechanical engineer in building construction it was to his advantage to improve upon his knowledge of architecture and civil engineering, especially in the design of reinforced concrete and structural steel. A final course in building construction superintendence very nobly tied many loose ends together and served to orientate the writer so that he now enjoys equal facility in many branches of work.

Building Gliders at Cornell

By WALTER L. KOCH

STRICTLY speaking, the ships that we built at Cornell this summer are not gliders. Although they looked like gliders, they can not be flown, but are towed behind an automobile. They are ground trainers to be used for training young glider pilots first on the ground before taking them up into the air in a real glider. In every other respect they are gliders. They have wings and tail surfaces and even an enclosed fuselage, complete with cockpit and controls for the pilot. The machines are steered like gliders and the student piloting the trainer on the ground has the sensation of landing or taking off in an actual sailplane.

Last May, when the New York State Department of Education decided to include in the regular industrial arts curriculum of State high schools a course in glider construction and gliding, Professor Lynn A. Emerson of Cornell was named director of a teacher training program. This program was to provide instruction for industrial arts teachers in the fundamentals of Aerodynamics, Soaring Meteorology, and Glider Construction. The course provided for eight weeks of instruction and was open to all industrial arts teachers in New York State. As it turned out, about twenty-five teachers participated in the program, among them the principal of a high school, several science teachers, art teachers, and vocational school instructors. These men are now back in their schools teaching boys and girls how to build gliders and eventually how to fly them. This is one of the first steps in a nation-wide educational program to make the youth of America air-minded, to introduce them to the science of Aeronautics, and to teach them the fundamentals of airplanes by building them. The boy who learns to build and later fly a glider will be a better pilot. He will have acquired the "feel" of the air and the skill of operating the controls of a plane at an early age so that the transition to power plane flying will be but a small step. The increasing demands of the aircraft industry and the fast-growing glider industry for man-power will be met by these boys and girls who receive their pre-aviation training while still in high school.

Skills Needed First

In planning the glider construction program it was realized that the skills required to build gliders and to pilot these "planes without motors" had to be developed first. A glider ground trainer appeared to be the solution. It had to be designed so that it could be built by boys of high school age with some experience in shop work. At the same time, in its construction it had to resemble closely an actual glider. The wings with their spars, ribs, and skin covering had to be essentially glider wings. The tail surfaces had to have the shape and interior structure of the rudder; the elevators and the fuselage with its skid, bulkheads, and plywood covering had to incorporate the same design details of a sailplane.

Fig. 2 shows the ground trainer as it was designed by Mr. Harry Perl, an accomplished glider pilot, in collaboration with the author. The wing area is not sufficient to give the plane enough lift for take-off even at speeds up to 50 miles per hour. The symmetrical airfoil section NACA 0012 was chosen for the wing which has a span of 20 feet and a chord of 27 inches. The wing, being of rectangular platform has thus an area of 45 square feet as compared with about 120 square feet for an actual glider. This explains why the ground trainer does not fly. The ailerons are extremely large, covering more than 60 percent of the total wing area, to give sufficient lateral control at slow towing speeds.

The tail surfaces, rudder, and elevators were designed so that the ground trainer can be steered at speeds as low 15 miles per hour.

Fig. 1. One of the ground trainers during preliminary assembly in the shop of Rand Hall.

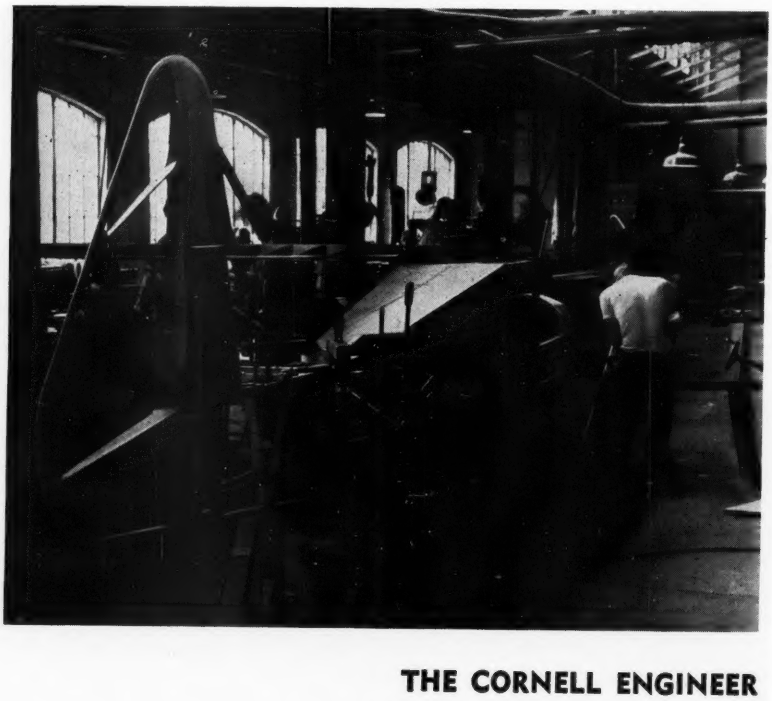


Fig. 2. The assembled ground trainer.

A sturdy landing gear with wheels placed far apart gives the ship stability on the ground. The whole plane is suspended from the landing gear struts at two points which lie horizontally in line about the center of gravity. A stable equilibrium is thus obtained at all times with the result that the plane will return to its level position if the pilot lets go of the controls. As the pilot is located ahead of the center of gravity, this weight serves to balance the weight of the tail. By adding ballast to the nose of the fuselage, the ground trainer can be balanced for any pilot. It was found desirable to leave the ship slightly tail heavy as the thrust of the tow rope aids the elevator in bringing the fuselage into a horizontal position during operation.

The construction of three ground trainers was begun in July, after completion of the preliminary design drawings. The pattern shop on the third floor of Rand Hall was used as a shop. Sufficient space for the construction of fuselages and wings was obtained by removing a row of work benches. The work started with the layout of the wing airfoil section and the platform of the tail surfaces. Jigs had to be constructed to assemble the framework of the fuselage (see Fig. 1), to shape the wing spars, and for bending the thin plywood skin of 1/16" thickness around the nose section of the wing. The construction program was augmented by a course in elementary aerodynamics, techniques of gliding and other subjects related to gliders to provide some basic knowledge of the theory of gliders for the industrial arts teachers participating in the course.

Construction Technique

Special emphasis was placed on certain typical techniques of glider construction, such as the application of glue, the use of plywood gusset plates where glued joints had to be strengthened, and the use of nailing strips in the assembly of the plywood skin. The latter are used instead of clamps, where skin is glued on to the bulkheads and longerons of the fuselage for the application of clamps is difficult. A small strip of plywood is nailed to the outside of the skin over a bulkhead or longeron after both the surface of the longeron and the contact surface of the skin have received a thin coat of glue. The nails of the nailing strip are cement coated and placed ½" to 1" apart, thus giving a clamping pressure of about 200 pounds per square inch. After the glue has dried sufficiently the nailing strips are removed and the holes left by the nails filled up.

A high standard of workmanship was maintained throughout the course. The structure of a glider in flight must resist airloads that are in excess of the design loads of most power planes. All structural parts therefore have to be built with care and precision.

To fill the need for instructional material for the use of teachers and students alike a manual on the construction of the ground trainer was developed in which the trainer was broken down into small sub-assemblies and job sheets. A complete set of design drawings augments the manual.

The first ship was "test run" on a large pasture and proved quite satisfactory. Glider pilots who made the initial runs reported that the sensation of piloting the ground trainer is that of gliding in for landing in an actual glider. The towing speed is comparable to the landing speed of a glider and the forces on the controls correspond to those of a glider in slow flight. Due to the fact that the trainer has a rather long fuselage ahead of the landing gear and that the center of gravity

(Continued on page 31)

THE AUTHOR

WALTER L. Koch had three years of practical experience in the automotive and aircraft industries before entering the Institute of Technology in Hanover, Germany. He came to the United States in 1936 and entered the California Institute of Technology, where he received his M.S. degrees in both Mechanical and Aeronautical Engineering.

In September, 1941, Mr. Koch came to Cornell as instructor in Aeronautical Engineering. Last summer he took part in the glider construction program, being in charge of writing the "instructional material."

The Brooklyn-Battery Tunnel

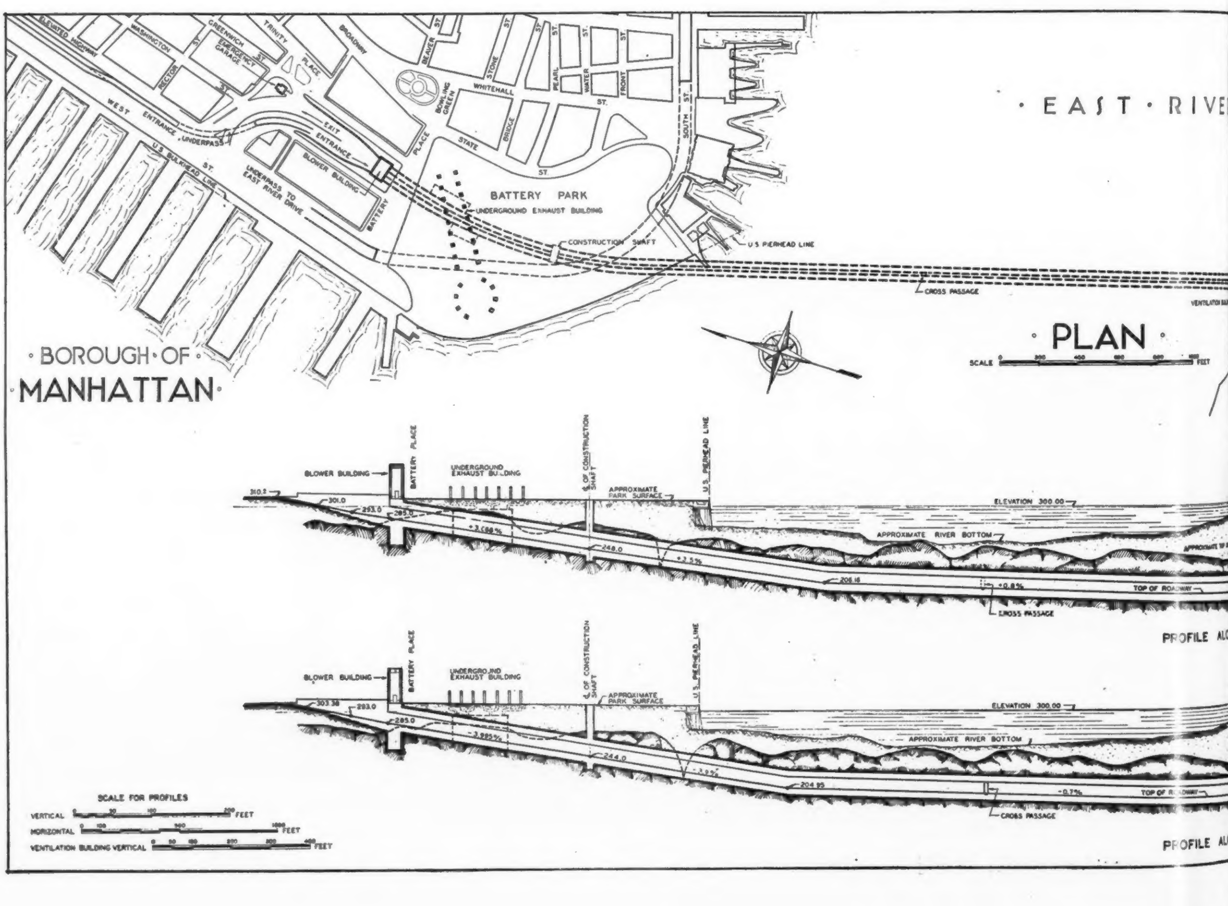
By ROBERT A. OLMSTED, CE '45

THE City of New York, wonder city and proud possessor of some of the world's most outstanding engineering works is about to have another notable feat added to its never ending list. This is the Brooklyn-Battery Tunnel.

About eighty-five percent of New York City's area is situated on islands. The presence of wide rivers, pseudo-rivers, and bays makes the metropolitan area one of the world's greatest ports, but it has also made the problem of getting from one part of the city to another a huge and difficult one. Manhattan Island, the metropolis' nucleus, is separated from the New Jersey mainland on the west by the broad Hudson; from the New York mainland to the north (Bronx and Westchester) by the Harlem; and from her sister boroughs of Brooklyn and Queens on Long Island to the east, by the East River, really a tidal strait. The crossing of the Harlem, a comparatively narrow stream, was quickly solved with the construction of numerous bridges, today a source of congestion. In the meantime, the ferryboat was the sole vehicular carrier to the east. It was in 1883 that the first actual crossing of the East River became a reality with the opening of the world renowned Brooklyn Bridge. The success of this undertaking, and the rapid rise in the volume of traffic led to the construction of more and bigger bridges, so that today there are seven of them crossing the East River to Long Island, including a railroad bridge.

The first crossing of the Hudson River was a railroad tunnel, started in 1879, but due to accidents, lack of tunneling experience, and difficulties in financing, it was not complete until 1908, when it opened as a part of the Hudson and Manhattan Railroad. The Pennsylvania Railroad soon followed with the extension of its line to its New York Terminal. The first vehicular crossing of the Hudson was the Holland Tunnel, begun in 1920 and finished in 1927. Many of the features of this tunnel have been used as a model for subsequent highway tunnels. This twin tube project was started under the direction of Clifford M. Holland, whose name the tunnel bears. After his untimely death, the tubes were completed with Ole Singstad, famous tunnel expert and present chief engineer of the New York City Tunnel Authority, at the head. Eleven years later, in 1938, a second subaqueous highway, the Lincoln Tunnel was opened beneath the Hudson's waters.

It was not until 1940 that the first automobile tunnel was opened to traffic under the East River. This, the Queens-Midtown Tunnel,



probably the most difficult tunneling job of its type in the world, was built directly opposite the Lincoln Tunnel, two miles away, so that an underpass connecting the two to avoid congestion in the streets, is contemplated.

It became evident quite some time ago that another crossing of the East River would be needed in lower New York near the Battery, as Manhattan's southernmost tip is called. The three downtown bridges had carried as many as sixty million vehicles in one year, pouring this load into congested streets hopelessly snarling traffic. This brought about the Brooklyn-Battery Tunnel idea.

The tunnel was first officially proposed in 1929, when the old Department of Plant and Structures prepared a preliminary plan. At that time the suggestion of a bridge was dismissed as being impractical. The project lay dormant until 1935, when traffic studies of the East River bridges showed that the project would be worth while. The tunnel was approved by the city in 1936, and a sum of $75,000 was voted the newly formed New York City Tunnel Authority for test borings and preliminary work. The Authority was, however, unable to obtain funds from the PWA for the actual construction.

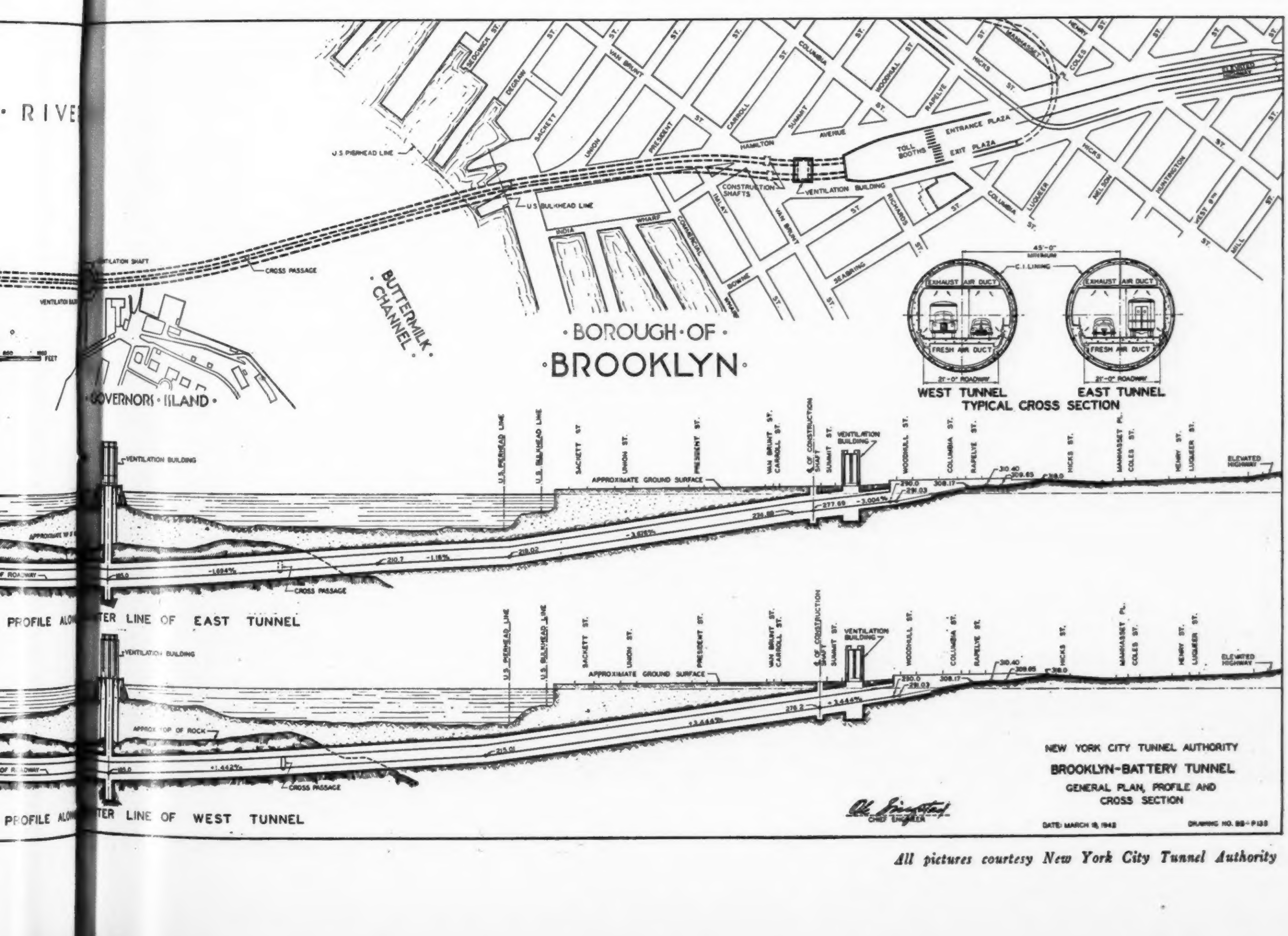
Tunnel vs. Bridge

Due to the inability to finance a tunnel, and because of the pressing need for a crossing, which was augmented by the building of the Belt Parkway around New York, the suggestion to construct a bridge was made early in 1939. A huge controversy arose between the tunnel and bridge interests. There were some good sound arguments in favor of a bridge. First of all, its cost was estimated at $41,000,000, or about one half that of the tunnel; secondly, the bridge supporters argued, maintenance costs would be lower; thirdly, the traffic capacity of the bridge would be greater, as there would be six lanes of roadway built, as opposed to four for the tunnel; and finally the bridge could be built in a little more than half the time required for a tunnel.

On the other hand, the tunnel proponents argued that the bridge piers would hamper navigation (which was denied by those desiring a bridge); the span would mar New York's famous skyline, and would destroy the beauty of Battery Park; and as in the case of similar structures, the property values of land adjacent to the approaches would be lowered, while a tunnel has always increased property values.

The greatest disadvantage of a bridge, however, was a military one. About two and one half miles north of the proposed site lies the New York (Brooklyn) Navy Yard. Should the bridge, or one of the other two spans to the seaward of the Navy Yard be destroyed, thus bottling up the channel, the yard would obviously lose a great deal of its value until the river was cleared. It was for this reason that the proposal of a bridge was rejected by the War Department when it was submitted for that body's approval. Previous to this decision, it seemed that the job would go through, as both the City and the State of New York took care of the necessary legal steps.

Finally in 1940, the Reconstruction Finance Corporation loaned the Tunnel Authority $57,000,000 for the underwater crossing, plaza to plaza, exclusive of real estate.



All pictures courtesy New York City Tunnel Authority

Ground was broken by President Roosevelt on October 28, 1940.

The general direction of the twin tubes is north and south, from Battery Park in Manhattan to Hamilton Ave. in Brooklyn. They curve slightly towards Governors Island where a ventilation shaft will be built. Construction shafts have been dug at the Battery and in Brooklyn. It is from these shafts that the tubes advance riverward and the excavated material is removed though them. The entire length of the tunnel from street grade to street grade is 11,100 feet, of which 9,117 feet lies between portals. This makes the underwater structure a quarter of a mile longer than the Holland Tunnel and a half mile longer than the Queens-Midtown Tunnel. There are no sharp curves in the crossing, the minimum radius of curvature being 1,562.5 feet. The maximum upgrade is 3.67% in the east tube approaching the Battery, while the maximum downgrade is 4.00% leaving the Battery in the other tube.

As a result of test borings to determine the character of the river bed, it was discovered that the level of the rock was higher than originally thought. By lowering the tunnel level, most of the work from the Battery to a point about 1,000 feet south of Governors Island could be built through rock, keeping the use of compressed air to a minumum. As a result of this decision, the roadway reaches a lowpoint of 115 feet below mean high water at the Governors Island shaft. This is deeper than either the Holland, Lincoln or Queens Midtown tunnels. There is a dip in the rock level at the Battery where compressed air has to be used.

Tunneling Problems

Starting at the Brooklyn end, the soil consists of stratified sand and gravel, with some clay and boulders, and as the tunnel goes under Buttermilk Channel, the river bed contains stratified silt and clay. The use of a shield and compressed air is required through this type of ground. The shield used in the Brooklyn-Battery Tunnel may be described as a circular iron casing slightly larger in diameter than the finished tunnel. Its purpose is to support the excavation and to protect the workers (called sandhogs) from the riverbed or ground overhead as they dig in the heading of the tunnel; and to allow the permanent cast iron lining to be built in the protection of the tail of the shield. Each section of lining, or ring, of the Battery Tunnel consists of fourteen cast iron segments and a key securely bolted together, with the diameter of the finished tube being thirty one feet. Each of the heavy cast iron segments used in the shield construction of this tunnel is thirty two inches long (parallel to the axis of the tunnel) and weighs 1.5 tons, a complete ring weighing 22.7 tons. An erector arm, situated in the shield, lifts the heavy segments into place, while husky crews permanently fasten them together. When each ring of lining is completed in the rear of the shield and the excavation which is carried out in the face of the shield advances a corresponding ring length, the shield is shoved ahead another thirty-two inches by hydraulic jacks placed in the rear of the shield. These jacks, twenty-eight in number, react on the completed lining, and operate at a pressure of 5,000 pounds per square inch. The forward edge of the shield is beveled in order to cut into the soft ground with greater ease. The face of the excavation is supported by breasting, while compressed air is used to keep the river water out. The shield-driven portion of the tunnel extends about 2,800 feet northward from the Brooklyn shaft and is lined with heavy cast iron. The remaining 4,900 feet to the Battery shaft, built through rock, will be constructed of light cast iron (weighing only 12.5 tons per ring), except for the dips near that shaft, where the heavier cast iron will again be used. The sections from the shafts to the portals will be made in an open cut and will consist of steel bent and concrete construction. Upon completion of the job, the construction shafts will be filled in.

The finished tube will be lined with concrete, and the ceiling and walls will be tiled. The two lane roadway in each tube will be built with a considerable space beneath it, leaving a large duct. The same is true above the ceiling, which will be 13 feet - 6 inches above the road. This tunnel will be the first to use fluorescent lighting. Although this type of illumniation is more expen-

View of typical 31-foot diameter heavy cast iron lined tunnel.

sive to install than incandescent, operating expenses will be considerably less. The quality of the light will be better and its intensity can be controlled more readily.

Of great importance in a vehicular tunnel where automoblies release their unhealthful exhaust gases is proper ventilation. The method used will be similar to that developed in the Holland Tunnel and adopted in subsequent highway tunnels. The duct beneath the roadway is used to supply fresh air to the tunnel through flues just above the curb. The exhausted air is removed through ports in the ceiling. At each portal, and at Governors Island, ventilation buildings will be constructed with a total of twenty-seven blower fans to provide fresh air to the tubes, and and twenty-six exhaust fans to draw the vitiated air out. These fans can supply the two tunnels with 4,200,000 cubic feet of fresh air a minute, which equals 42 complete changes of air each minute. As a result, the air in the tunnel will be purer than on many a city street.

A matter which deserves strong consideration in the design of an artery of traffic with a large volume of business is the study of approaches. These are often elaborate and costly. To dump millions of cars onto already over-crowded streets would help destroy the original purpose of the tunnel. The tunnel itself is an important link in a vast system of express highways and parkways, a large portion of which already exists or is under construction.

Erecting and tightening cast iron tunnel lining at rear of shield (Battery Tunnel)

Approaches

The main express access from Manhattan, a narrow island about twelve miles long and two wide, is the West Side Elevated (Miller) Highway. This thoroughfare leads to the Westchester County Parkways and points north, and provides a convenient approach to the Hudson River crossings to New Jersey. At present this roadway ends approximately three quarters of a mile from the tunnel plaza, but will be extended south by the City under the terms of the agreement with the government at the time it loaned the money for the consruction of the tunnel. Another express artery leading to the tube is the new East River Drive also to be extended by the City to the tunnel plaza. This involves the construction of an underpass through Battery Park. It is estimated that eighty percent of the tunnel's traffic will be bound for the West Side of Manhattan. The tube, therefore, not only serves to relieve congestion on the East River Bridges to downtown Manhattan, but also on the crosstown streets leading to the West side. To aid West Side distribution of the traffic, two additional ramps are proposed from the Elevated Highway. The Manhattan Plaza will occupy a block now covered with old, dilapidated buildings, thus improving the neighborhood. A system of underpasses will keep friction between opposing streams of vehicles to a minimum.

At the Brooklyn Plaza, where all toll booths will be located, the tunnel will have immediate access to the express highway crossing the Gowanus Canal on a fixed high-level bridge, or to Hicks Street, which will eventually become a part of the express Brooklyn Shorefront Highway. It is estimated that 25% of the tunnels traffic will originate in Flatbush and beyond in the east, requiring the construction of an express thoroughfare through Prospect Park. This route, connecting to major arteries leading southward and eastward, is considered an important factor in the financial success of the Battery Tunnel. After crossing the Gowanus Canal, the Gowanus Parkway leads directly to the Bay Ridge section of Brooklyn, and also to the Belt Parkway System.

Priorities

In addition to its commercial value, the Brooklyn-Battery Tunnel can provide an excellent highway for military use, especially since the tube is much harder to destroy by aerial attack than its neighboring bridges. Nevertheless, the Tunnel Authority has lost the high priority rating it enjoyed before Pearl Harbor, and recent decisions of the War Production Board may force work on the tunnel to be abandoned for the duration although it is studying the matter. The construction of a number of the approaches already mentioned has been postponed until after the War, and funds for some of them have been included in New York's Post War Program.

The Cold Shoulder . . . An Editorial by E. W. ROSS

CORNELL has always been a school of strong traditions, commendable leadership, and student-faculty harmony, but those days are passing fast. The University's war policies have stricken our traditions from the record. We as students no longer feel the close association we should have with our Administration. Our interests are being ignored so as to leave us the impression that we are no longer wanted.

Why are we not capable of running our own affairs? We came to college because we thought it had many advantages to offer us, but the further we progress, the harder it is to find these advantages here at Cornell University. Sense out our student opinion and you will find the students in a bemuddled, discouraged state. Are we at fault or is it something wrong with our Administration?

Let's look back a few years and see if we can't pick up a trend. Four years ago the most fun we had was at our traditional Frosh-Soph flag rush. Some of us skinned our knees a little bit, but we enjoyed it, and we are still alive today. Look back less than four years. Do you remember our big political rallies with their speeches and hubbub that used to keep things stirring?, how our coalition gained in strength until finally we threw the election? Do you remember how "sloppy" Joe almost won the election as the BDMOH or the best dressed man on the Hill?

Those were the good old days! We lived with the spirit of democracy then; we had our own student government, they represented us and they acted for us. We were free men; we could make our own decisions and we ran our own affairs. We were meeting life's problems first hand, and more than that, we had our incentive for showing interests in our work.

Well, our Administration has since taken care of all those things. Due to the urgency of our war effort, our Administration did not think that we should waste our time on such silly things as traditions and truly representative student government. We are definitely in an urgency period but its meaning and understanding must be more thoroughly comprehended. Our war effort is indeed a big thing, a much bigger thing than just an excuse for throwing around as a basis of our Administration deeds.

Now fraternity coalitions have been disbanded, interclass rivalry and house parties suspended, automobiles outlawed, physical fitness compulsory, and they give us in addition a "rubber stamp" council that sways with Administration opinion to represent us. We are not asking for "business as usual". A lot of these changes are good and necessary. But some are infringements upon the rights and privileges for which this University stands.

Whenever the University wants something done, it is the fraternities, clubs, and other Campus organizations that put it over. Think of all the past Campus Chest Drives, the Victory Campaign, the Scrap Metal Drive, and every other campaign that we have had on this Campus and give credit to our Campus organizations for their success. These organizations aren't the all powerful and that is why they ask for University cooperation and consideration when they have things of their own that they want done. And what do they get in return for their cooperation? A slap in the face more often than not. Each year they are deprived of a little more of their power, their right to organize and carry on their business as they see fit.

This year all competitive spirit is out because it is against the laws of the University. What is better than competitive spirit between classes, between organizations, or between students to create a natural interest in our work. We are not getting the support of the University for our right of free enterprise and thinking in the democratic way of life.

When the Administration banned automobiles for the duration, what was the result? One month later the *Cornell Daily Sun* published a statement saying that 25% of the cars were still here under some legal excuse. When the Administration banned houseparties, what was the result? Nearly every fraternity has been having houseparties or is planning houseparties in the near future with imports as dates. The only difference is that there are far fewer co-eds present and dates must stay downtown instead of in the fraternity house. The Administration considered cancelling Christmas vacation with alarming headlines appearing in our campus newspaper. Then after careful consideration, Christmas vacation was reaffirmed. This was a refusal of a recommendation to all Universities from Washington. This episode of jumping at conclusions only helped shatter our trust in the University. Cornell makes the print every time it does one of these things, but such cheap publicity.

Some of these changes are in the right way of thinking, but besides being good publicity they must have backbone, and none of these changes have just that. They were either passed in haste without careful thinking or passed without the slightest intentions of enforcement. Let's have a yes or no Administration that can stand together with the students, and if we decide, not the Administration alone, not the faculty alone, and not the students alone, but all of us together decide that something should be done, let's all pull together to see that it is done.

This is a time for close harmony when we should all pull together, and not the time when one faction acts for itself and considers the other faction afterwards. What we are asking for is that our Administration show a greater real interest in the students, that they leave behind their formality and mingle with us and get to know our problems too. Of course the University's problems are grave and serious, but so are ours, and we would appreciate their interests and cooperation in our work. We have shown our willingness to cooperate, and we should be only too glad to work together as one unit with one ambition, the ambition to contribute our best to the safety and welfare of our nation.

NEWS OF THE COLLEGE

New Option

MILITARY Science and Tactics has been made an additional option for students in all four schools of the College of Engineering. Twelve hours of credit for Advanced Military Science and Tactics will be allowed under a new faculty resolution.

Heretofore, although many students in the College of Engineering enrolled for the advanced courses in the Department of Military Science and Tactics, each was required to select a technical option, such as heat engineering, electrical communication, or sanitary engineering, and to take a prescribed number of hours of work in that option, regardless of the amount of time and energy he put into military training.

"There is a great need for trained engineers in many branches of military service," Dean Hollister said when announcing the program. "We believe, therefore, that the new combination of engineering and military training established in the college will have real importance in furthering the nation's war effort."

Society Elections

TAU BETA PI

Class of '43

William B. Correll
Herbert A. Gustafson
Theodore J. Hildabrand
Dyer B. Holmes
Robert C. Krebiel Jr.
Clyde H. Loughridge, Jr.
Edward A. Miller
John C. Pennock
Lowell J. Pierce
Raymond V. Pohl
Bruce A. Pope
James A. Purdy
Micea R. Sfat
George L. Swallow
Robert H. Underwood

Class of '44

Ralph Bolgiano Jr.
Frank K. Moore
John A. Newman

ATMOS

George F. Swallow '43
William J. Candler '43
Elbert Beehler '44
Franklin K. Moore '44
Charles W. Pressler '44
William S. Wheeler '44

ETA KAPPA NU

Frederick Arbuckle
Richard Best
Ralph Bolgiano
Richard Demmy
Robert Garmezy
Roger Jackson
Richard Koch
Joseph Logue
Anthony Prasil
Robert Rochlin
Milton Stolaroff
all of class of '44

The following men have been elected by their classmates to serve this year on the EE student committee on academic conduct: Dean B. Wheeler '43, Douglas B. Whitney '43, Robert H. Garmezy '44, and Carleton Whitman '45. The election was held by Eta Kappa Nu.

Football

ON the sunny Wednesday afternoon of November 18th the school of Civil Engineering opened its 1942 football schedule by defeating the College of Architecture, 12 to 0.

Goaded on by a series of brash

(*Continued on page 26*)

In Memoriam

GEORGE Burr Upton, professor of automotive engineering in the Sibley School of Mechanical Engineering at Cornell, died unexpectedly at 5 P. M. Thursday, October 29, 1942. He taught at Cornell 37 years. His widow, Mrs. Lulu Newman Upton, and two brothers survive.

Prof. Upton was born in Newark Valley, N. Y. in 1882 and attended schools in Denver and Ithaca before entering Cornell in 1900. He graduated as M.E. in 1904 and received his M.M.E. in 1905. He entered the department of experimental engineering as an instructor upon graduating, became an assistant professor in 1910, and a professor in 1919.

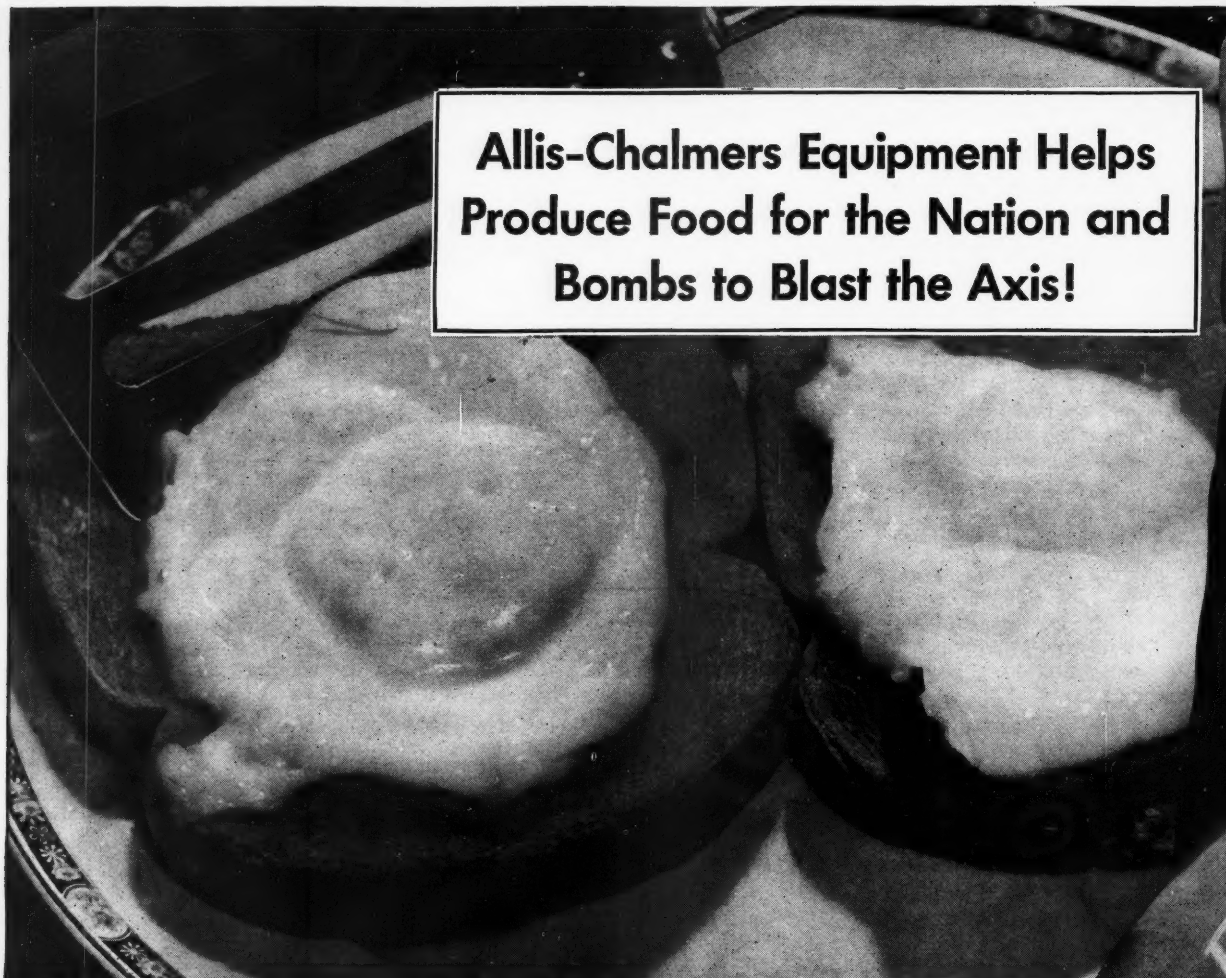
Prof. Upton was noted for his knowledge and research in materials of construction and in internal combustion engines, especially as applied to automobiles. He acted as consultant for the Curtiss Airplane Company and for the United States Government and was called as an expert witness in a number of patent suits.

Prof. G. B. Upton, M.E. '04

During World War I, he worked with the Bureau of Ordnance on heat treatment of shells and with the National Advisory Committee on Aeronautics on muffling airplane engines. He was the patenter of the Upton-Lewis fatigue testing machine developed in 1912 and was the author of the textbook, "*Materials of Construction,*" published in 1916.

Prof. Upton was a member of Sigma Xi, Tau Beta Pi, ASME, American Society Testing Materials, Society of Automotive Engineers, and the American Society of Metals.

EGGS...ON TOAST OR



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Backing up the men and women working for Victory in our plants are Allis-Chalmers engineers in the field. They are helping manufacturers produce more—not just with new machines, but with machines now on hand!

Allis-Chalmers past experience is vital to the Nation now. Its present experience will be invaluable *after* the war to help produce more and better peacetime goods for everyone!

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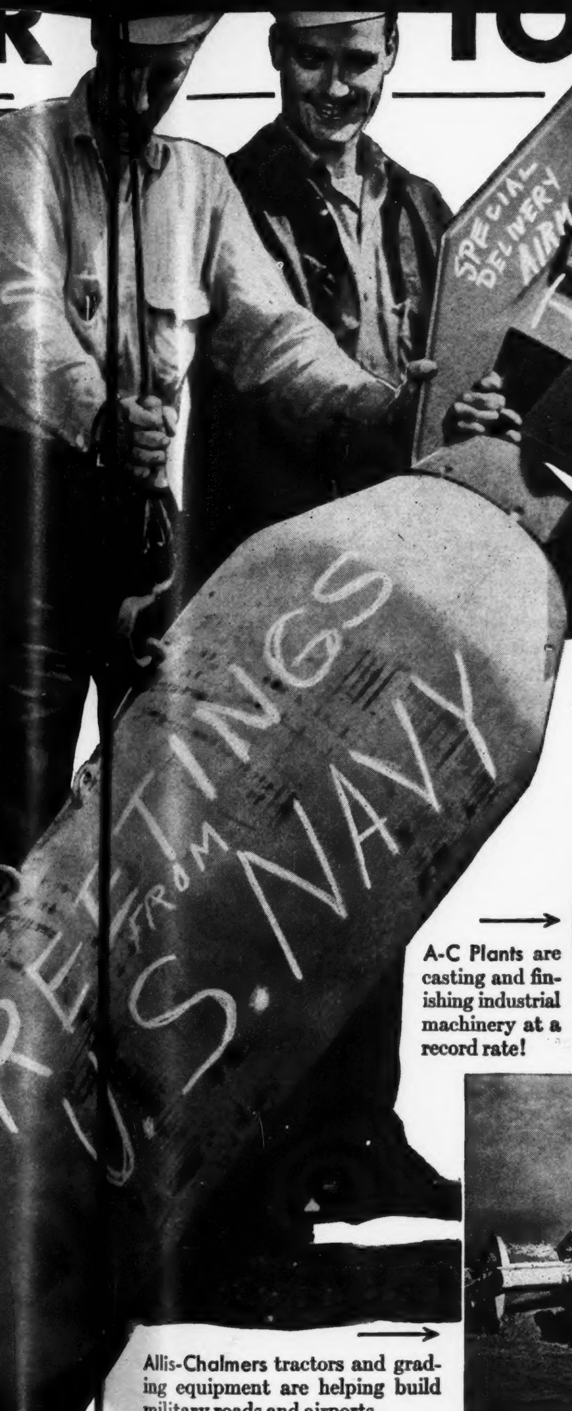
R TOKYO!



A-C Equipment helps produce both steel and explosive charge for demolition bombs like the one here.

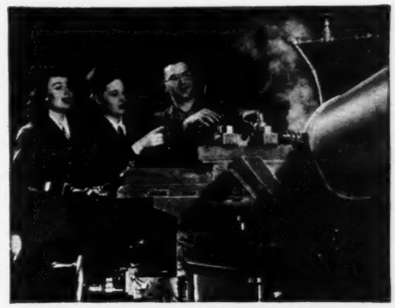
A-C Plants are casting and finishing industrial machinery at a record rate!

Allis-Chalmers tractors and grading equipment are helping build military roads and airports.

VICTORY NEWS

Rosiclare, Ill.—91 Allis-Chalmers motors constitute the major portion of a connected load of close to 1,000 hp driving the new fluorspar mill of the Mahoning Mining Company here.

The efficient layout of flexible motors and drives is largely responsible for the plant's record production of high-grade fluorspar zinc-lead ore. Throughout the mill, the Allis-Chalmers motors operate dump hoppers, flotation cells, vibrators, kilns, pumps and many other machines.



"We're Buying and Building," an A-C workman tells MGM bond rally starlets, as he machines a Navy propeller shaft.

Milwaukee, Wis.—The "feed-back" system, which utilizes 85% of the enormous power expended in breaking in aircraft engines on test stands, has been adopted by Buick in its new plant in a mid-western city.

The new engines are connected by flexible shaft couplings to water-cooled magnetic couplings, which transmit power to 1200 kva synchronous generators.

Allis-Chalmers alternating current units are at work here. They not only help to crank the new engines, but they also operate as current absorption-type dynamometers—receiving power from the aircraft engine, turning it into electrical energy and feeding it back into the line. This test set-up provides a high percentage of the power required by this company's manufacturing operations.

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WE PLAN FOR PEACE

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Prominent Among

"Red"

Roy V. Johnson, AE

YOU who have seen the captain and right end of the Big Red football team in action this fall know of the high quality job he turns in each Saturday. His work the other six days of the week must be as good or better to judge from his record.

In his freshman year, Roy Johnson started his career with a bang by gaining his numerals in football, basketball, and baseball. He also made the Dean's List.

Since then, in addition to varsity football, "Red" has participated in interfraternity basketball and baseball. He was a member of the Freshman Discipline Committee. He has been working sixteen hours a week ever since his sophomore year, "protecting the books in Sibley library." As if this were not enough, he sells and distributes Coca-Cola on the campus. He is also chaplain of his fraternity, Phi Kappa Psi.

Despite all of these activities, "Red" is able to boast of an 81% average. Because of his remarkable record, he has been elected to Kappa Tau Chi, Tau Beta Pi, Aleph Semach, and Sphinx Head.

"Red" Johnson came to Cornell from Tarentum, Pennsylvania, the home of another great Cornell end, Alva Kelley. The records of these two men at Cornell, although separated by two years, are strikingly parallel. "Red" was a three letterman at Shadyside Academy. Before leaving Tarentum, he was awarded a McMullen Regional Scholarship.

"Red" has spent the past few summers working. After his freshman year he was employed as a laborer for the Duquesne Light Company. During the last two summers he worked for the Alleghany Ludlum Steel Company, first as a machinist's helper, then as a millwright's helper.

"Red" was married to a Tarentum girl just before last Spring Day.

Our red-headed football captain is taking the ROTC Ordnance course. After the war, he plans to stay in the army. If this is not possible, he would like to get into production personnel work.

D. Brainerd Holmes, EE

AFTER graduating from Newark Academy "cum laude", Brainerd Holmes looked around for greater things to conquer. The offer of a McMullen Scholarship plus a long line of uncles, cousins, and what have you listed among the school's alumni, made Cornell seem too tempting to pass by. So with frosh cap in hand he modestly made his way through yards of enrollment blanks and miles of registration line until he finally found himself among the ranks of the enrolled. To date Brainerd has accumulated many honors and no regrets.

"Brain", as he is known to his friends, has lived up remarkably to his nickname. In addition to receiving a McMullen Scholarship he has been on the Dean's Honor List each of his three years here. He has also been elected to Tau Beta Pi, Red Key, Sphinx Head, Eta Kappa Nu and the Delta Club, which in themselves speak well of his record.

But you might say that "Brain" has not let his studies interfere with his extra-curricular activities. His fraternity, Chi Psi, saw fit to elect him secretary of the house his sophomore year. Having evidently proven himself quite capable to his brothers they saw fit to elect him house president his junior year and again this year. During his freshman year he earned his numerals in football and he received his junior varsity letter while a sophomore.

Last month he served as chairman of the "Cornell for Victory" Committee which completed the school's first campus-wide drive since the United States entered the war.

During a couple of summers he spent his time, ideally, as a lifeguard. Since that time, however, he has been commissioned an Ensign in the United States Navy and during the past summer he lived very much in the present times. He was on active duty in Philadelphia and served in the Navy Yards there. He was allowed to come back to school, but he will go on active duty immediately upon receiving his degree.

"Brain's" option in the Electrical Engineering School is communications and when times are once more normal, he intends to get into a branch of this field that is related to aeronautics. In the meantime he will be another, although not "just another", of Uncle Sam's officers.

"Brain"

Cornell Engineers

Prof. Black

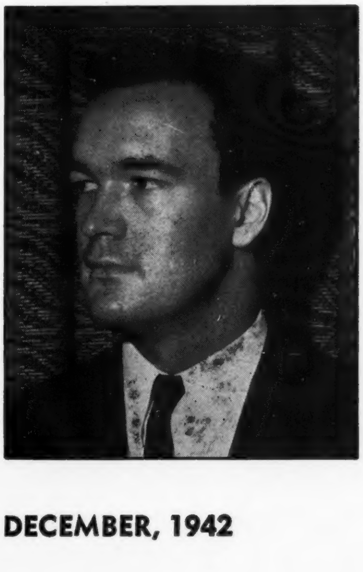
Herbert A. Gustafson, CE

DURING the past three years Herb Gustafson has been enlarging an already broad educational experience. When his high school days were drawing to a close, he heard about, tried for, and won a scholarship to Deep Springs Junior College in Deep Springs, California. For Herb, who hailed from the Midwest's Chicago, this was quite a change. This school was operated under an extraordinary plan. The school itself was located on a ranch and the students operated the ranch while following their chosen courses of study. While there Herb mixed practical work about the ranch with a major in English and quite evidently did alright. A scholarship brought him to Cornell where he entered as a sophomore. He immediately accepted an invitation to join Telluride.

During the past summer Herb studied here at Cornell, mixing the regular course with a special summer surveying course for accelerated students.

During previous summers he has worked on marketing survey calculating the effect of various advertising programs on actual sales increases; and he worked for a short while as a ranch hand.

"Herb"



While taking Cornell's Civil Engineering Course in his stride, Herb also added other envied achievements to his record. In addition to Telluride he has gained election to the coveted Tau Beta Pi. He serves at the present time as secretary-treasurer of Chi Epsilon, a Civil Engineers' honorary society. His is, of course, a well established name on the Dean's Honor List.

During his freshman year he went out for baseball, and during his three years in the Telluride House he has taken an active part in their successful intra-mural program.

With graduation coming up for him in January, Herb expects to get into construction work associated with the war effort. Airport construction work is his choice. His ultimate goal is to get into forestry conservation work in the West, and he intends to follow up this ambition when peace comes again.

Prof. Paul H. Black

EVER since his childhood days in Huntington, Pennsylvania, Assistant Professor Paul H. Black has been interested in machines. While he was in high school, radio was just coming into its own, so he spent much of his time building and tearing down small radio sets.

During his undergraduate days at Rensselaer Polytechnic Institute, Professor Black maintained his interest in radio by playing the cello over a nearby radio station. He was also a member of the college track team. In 1925 he received his ME degree from R.P.I. and taught machine design there the following year.

After leaving R.P.I., Professor Black worked for two years in the research and design departments of Westinghouse. In 1928, he joined the faculty of the University of Illinois, where he remained till 1937, when he came to Cornell as a professor of machine design. While at Illinois he was elected to Sigma Xi and became a member of the American Society of Mechanical Engineers and the Society of Automotive Engineers. Professor Black received his master's degree from the University of Pittsburgh in 1931 after a couple of summers of graduate work there.

Since he has been at Cornell, Professor Black has assisted in personnel work. He has already interviewed over a hundred of the 130 senior AE's and ME's. In the field of mechanical engineering he is interested in stress concentration in fatigue. This consists of a microscopic investigation of mechanical members that have failed in order to determine the cause of failure. He finds this as fascinating as a detective story, since there is only one logical solution that will fit the clues that are present.

Although he is very much interested in his work, Professor Black finds time for his favorite diversions of hiking, cycling, tennis, and rowing. He has been married for three years to a Spanish-American girl, a Puerto Rican school teacher.

Professor Black believes that the trend of the times is for engineering students to receive a broader background with which to meet the demands of industry. In speaking of his own profession, Professor Black believes that an instructor should "try to understand these new trends. He should then fit the subject matter to the student, not the student to what he has to teach."

THE ALUMNI

Shipbuilder

TRIBUTE to the accomplishments of submarine builder, Charles C. West, M.E. '00, is paid in a recent issue of Time magazine. West is owner and founder of Wisconsin's booming Manitowoc Shipbuilding Company. A ship builder for 42 of his 65 years, he landed his first Navy contract in 1940 and delivered the 10 submarines it called for eight months ahead of schedule. He was then given a contract for invasion barges which were delivered only eight months after the contract was signed. For this remarkable performance the Manitowoc yards were awarded the Navy "E" for outstanding production and West was given contracts for many more ocean-going submarines.

Associated with him are his two sons, both Cornell graduates in mechanical engineering, John in 1912 and Robert in 1934.

Many of the workers in the West yard are former dairymen, farmers, or hired hands fom neaby agricultural regions. All are put through a tough apprentice period and upon completing it are truly "custom tailor shipbuilders."

As the only inland builder of intricate closely-packed ocean-going submarines, he has enough orders to keep him going full blast until 1945. Mr. West modestly says of his achievements, "This is no Henry Kaiser outfit. This is just a hell of a sweet team and we're carrying the ball. That's all."

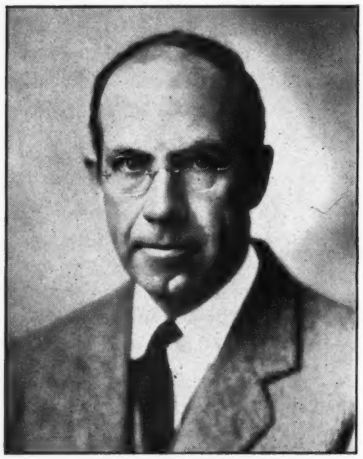
R. Toms Dies

THE death of Raymond Toms, C.E. '07, was announced in Washington early in November. Up to the time of the illness leading to his death he was head of the division of design of the Public Roads Administration, Federal Works Agency, and as an authority on highway engineering he played a large part in the design policies for access roads to Army and Navy bases and war plants.

GE Manager Dies

NELSON Jarvie Darling, manager of General Electric's West Lynn and River Works, died October 26 at the age of 58 following an illness of a few months.

Born in Toronto, Ontario, he graduated from Cornell in 1907 after completing courses in mechanical and electrical engineering. He then joined the General Electric test course as a student engineer, but in 1909 was loaned to the Dodge and Day Company to assist in the installation of electrical apparatus in the Panama Canal Zone. Rejoining General Electric in December of that year he gradually worked up to these responsible positions he held at the time of his death.



N. J. Darling, M.E. '07

ASCE President

THE election of Ezra B. Whitman, C.E. '01, as president of the American Society of Civil Engineers for 1943, brings the number of Cornell graduates now heading major engineering societies to two. The other is James W. Parker, M.E. '08, currently serving as president of the American Society of Mechanical Engineers.

Mr. Whitman is at present a consulting engineer in Baltimore. However, his career has been marked by a wide variety of activities both in the engineering field and in civil life. In World War I, he was officer in charge of utilities and construction for the Quartermaster Corps at Camp Meade. In 1919 he was sent to Poland to investigate post war civil conditions. Returning to this country he served on the Maryland Public Service Commission and became senior partner of the firm of Whitman, Requardt, and Smith of Baltimore.

Mr. Parker, the ASME president, is now vice president of the Detroit Edison Company which he has been connected with since 1910. He served with the nitrate division of the Ordnance Department during the last war. In 1935 he was awarded the honorary degree of master of science of mechanical engineering by the Detroit Institute of Technology, and in 1941 he was president of the Engineering Society of Detroit.

Morrow Dies

PROFESSOR Lester W. Morrow, M.E. '11, formerly on the staff of the College of Engineering at Cornell, died at his home in New Brunswick, New Jersey, on November 15. At the time of his death he was instructor of electrical engineering at Rutgers University. After leaving Cornell, he became Professor in Electrical Engineering and director of the School of Electrical Engineering at the University of Oklahoma. He then spent four years at Yale, and from 1921 to 1937 was editor of "The Electrical World." He was also employed as general-manager of the fiber products division of the Corning Glass Works and later as regional editorial director of the McGraw-Hill Publishing Company.

Professor Morrow was a member of the Engineering Council for Professional Development, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, and the American Electro-chemical Society.

"Loose Juice"

By BOB GARMEZY and ED RICH

Communications Engineers
By A Power Man

A communications engineer is by definition a human (?) who cannot comprehend the significance of E = IR ad must resort to foreign languages to conceal it. Communications is the only field in which one figures the efficiency without figuring in the heat loss. That is how they get a "gain" (something for nothing); the power in the filaments is not considered as input. Is it legal to apply a fixed potential to a grid? Definitely not, it must be biased (why should a normal grid be biased against anything?) If one is artistic, the electronics apparatus is a treat. One must be a surrealist with six zombies to appreciate it. Each wire is equipped with a mousetrap fastener, and all are thrown together in the hope that the correct ones will snap together. The notebook of one of our more illustrious communications men yielded the following definitions:

Armature reaction is that which occurs when an engineer gets too familiar despite resistance.

A Rotating Field is that found at a football game with the aid of a bottle.

Corona is the name of a good cigar.

Form Factor equals the ratio of your girl to Betty Grable.

j Vector is a smooth operator.

Resistance is draft board reaction to a deferment resulting in immediate *inductance,* whereupon the *capacitance* is tested via the Dutch.

Circuit Breaker is the guy who disconnects the apparatus after the experiment is completed.

Child's Law is the law prohibiting birth control.

Three Phase lit, drunk, and blotto.

Teaser Transformer burlesque queen.

Y-Delta Conversion is an exchange dinner between the Y.M.C.A. and the Tri Delts.

Editor's comment:
Herewith we present a new feature page—this month devoted to the quirks and doings of the EE School. This page was prepared by the two gentlemen listed above, aided and abetted by Fred Arbuckle, Dick Best, John Nairn, Bob Seldon, Bud Thompson, and Professors Ballard, Cotner, Meserve, and Strong, all certified fuse blowers.

A Heavy Duty Bus is the main supply between the Dutch Kitchen and Balch at 12:29.

An Alternator is a guy who has more than one girl friend.

A Rectifier is that which Prof. Strong uses when the 410 marks are too low.

Knife Switch is that which occurs when you take a good-looking girl to a house party.

Air Gap is that gap due to a faulty zipper.

A Fuse is a circular disk of copper with Lincoln on one side and writing on the other.

A Tirrill Regulator is a fancy name for a communistic bartender.

With the little respect that the communications men hold for power, we can only assume that they run their sets on imagination. From the above it can be seen that communications men live in a world of their own, for which we are thankful. However, since time wounds all heels; the profession can look forward to the removal of this blot upon its glorious record.

Power Engineers
(*Read Imaginatively*)

The other day as I was casually walking down the halls of our dear Franklin, I tripped; and there below me was a small boy, apparently a power engineer in the making as I surmised from the squeaky voice and stupid look on his face. "Pardon me, my boy," I said graciously. "That's all right," was the reply. "I was lookin' for you anyway. We was all wondering whether or not if you wouldn't mind writing an article on Power Engineers for our page in the CORNELL ENGINEER." I chuckled to myself silently. "Sure, glad to," was my reply; and the small boy with the high pitched voice vanished, not knowing I was a Communications Engineer.

For weeks now I have been wondering what this short, black-haired lad with the heavy dark rimmed glasses had in mind when he asked this of me. Nevertheless, I could not restrain myself from giving vent in black and white to what communications men think of these forsaken slaves of misconception.

Little do these befuddled excuses for engineers realize just how much they owe to their superior, more intelligent colleagues specializing in communications. Why, without the communications engineer the present all-important concept of frequency would be to them "out of this world." They would undoubtedly be still clinging ignorantly to the view of frequency being the number of times the power company submitted bills to their customers. Such distorted concepts are very prevalent among the so-called power engineers. Upon questioning one of the more intelligent looking of them, I found that power men think of core loss as the juice that leaks through the core when you screw the nuts too tight on the transformer. Copper loss is, according to them, that loss which occurs when pennies are put in fuse sockets. Hysteresis is commonly accepted among them as an art student's thesis on American history. Their ideas on communications are equally messed up. They believe that a grid leak detector is an EE's substitute for hygrometer to be used by plumbers in

(*Continued on page 24*)

SALVAGING VITAL PRODUCTION TOOLS

Worn metal teeth no longer shelve the Tool — nor do they mean costly, hard-to-get replacements. Utilizing the intense heat of the oxyacetylene flame, the Airco Hard-Facing Process quickly "builds-up" the worn metal. Parts thus rebuilt can be expected to out-live and out-produce new parts.

Airco Hard-Facing is doing an unprecedented job today in conserving time and material. Parts of practically any shape and size, which are subject to abrasion, can be rebuilt economically, speedily. Standard oxyacetylene welding apparatus is employed.

Many other applications of the oxyacetylene flame are finding ever widening use in speeding and improving production of ships, tanks, guns, rolling stock and planes. This versatile tool slices through steel with remarkable speed — welds metal into strong, light units — sweeps surface rust from metal structures to extend the life of paint jobs — gouges steel and iron quickly and accurately.

"Airco in the News" shows many interesting uses of the oxyacetylene flame and electric arc. Write for copy.

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Loose Juice

(*Continued from page* 22)

locating faulty water pipes. Their conception of oscillation is a to and fro motion caused by impulses from a heated emitter contained in an evacuated envelope leading eventually to saturation, more output being realized under properly tanked conditions. In general they believe that these oscillations are more really received if proper manipulation of the knobs has been effected in the tuning-up process.

We believe that it is indeed too bad that these poor witless creatures have to suffer under such a mental handicap. The present war effort to obtain men trained in communications is sufficient to show the error of their choice. But we have pity and fully realize that there are among us some upon whom the fickle finger of fate has imposed great limitations, and they must contend themselves with the more elementary toys of the mind.

Flash!

It is officially reported that the Japanese have taken Sal Hepatica. The U. S. foreign office admits this report, but denies their ability to hold it. The strain on the rear is terrific! The Japanese have made several attempts along the line to evacuate, but these have met with little success being confined mostly to gas attacks. The Japanese deny this statement, but it leaked out and the Allies got wind of it. The Japanese now realize the value of scrap paper.

New Development—A machine which, when your answer is registered, will give you the multiplication, division, addition, subtraction, square root, cube root, square, and cube factors by which your answer must be compensated to give the right answer. We are still working on a machine to give the intermediate steps to the answer. A possibility?

Questions to the Editors or Mis-Information Please

Question: What is used for large starting torques in induction motors?

Answer: *A double squirrel cage rotor. This enables the use of a larger species of Squirrel which rotates the cage according to the third law of motion (see the case of "The apple vs. Sir Isaac Newton"). In other words, the double squirrel cage allows a larger squirrel, more excitation, and hence more torque.*

Question: What are the brushes used for on a D-C motor?

Answer: *Any fool would know that brushes are used to clean the flux out of the armature teeth and the oil off the commutator.*

We regret to say that we cannot help out the student in 481 *with regard to the Malti-valued function.*

Question: What data is necessary to determine the load on a transmission line?

Answer: *Any dumb ME could answer this. The tensile strength of course.*

Question: As the current will lead the voltage by 90 degrees across one condenser, does it lead by 180 degrees across two condensers?

Answer: *We have to admit that it was the day we cut, but we are informed by E. Miley Post that this is not the case in the best of condenser circles.*

The College

(*Continued from page* 15)

articles appearing in the *Cornell Daily Sun* boasting of the prowess of the Architect's squad, with its T-square and V for Vichy formations, the CE's struck with a ferocity which so overwhelmed the boys from White Hall that they were scored upon on both the first and second CE plays of the opening minutes of the game. The first score came on a pass from Di Stasio to left end Blanche, the second touchdown on another pass also tossed by Di Stasio.

Quickly sizing up the quality of their opposition, the CE's contented themselves with rolling up a substantial margin of yardage over their hapless opponents, who were kept (for almost the entire game) deep in their own territory through their own inability to gain either by land or air to any great extent. Several passes were intercepted by an alert Lincoln squad, and two quick kicks caught the Architects flat-footed deep in their own territory.

All in all, a grand time was had by all, including over 100 students and Faculty. It is hoped that the abilities of the losing squad will be sufficiently improved to merit a return engagement next year.

AE's vs ME's

Kappa Tau Chi was doomed from the beginning when it took upon itself to challenge a much more powerful Atmos team on Upper Alumni Field a week or so ago. Although the AEME's were there in spirit, they lacked the finesse and polish of the ME's, the latter winning by the overwhelming score of 24-0.

Bill Stern would have undoubtedly proclaimed Andy Gill a nominee for his All-America team had he only been able to witness the Atmos star race up and down the field to score four times. The mighty ME line held Kappa Tau Chi's "Touchdown King," George Marchev, to a minus 40 yards.

E.C.M.A.

The Cornell Engineer sent two delegates to the Engineering College Magazines Associated (E.C.M.A.) 22nd Annual Convention held at Purdue University October 16th and 17th. Delegates from Cornell were Walton Ross, ME '43, Editor-in-chief and Robert Flack, ME '43, Business Manager. Eighteen other Engineering Schools throughout the country sent delegates to this convention.

The E.C.M.A. is a national organization of established publications dedicated to the advancement of the standards of engineering college journalism. Each year one of the member schools is chosen for the convention where the staff members of the various publications talk over their problems and ideas for bettering the magazines. Cornell University is slated to hold the 1943 Convention.

At the Convention awards were made to the outstanding publica-

(*Continued on page* 28)

DEATH CAR...

ONLY A CHILD'S TOY on an unlighted stairway. Yet as lethal as a speeding truck for killing or crippling. For causing heartbreak and tragedy in someone's home.

Accidents . . . in the home . . . on the highways . . . in factories and offices . . . cost this nation 102,500 lives last year. This tragic toll, preventable to a great extent, was augmented by the permanent disabling of 350,000 other people . . . by 9,000,000 lesser casualties.

Production-wise, America's war effort lost heavily. In all, 480 *million* man days were lost forever. Enough to have built a total of 20 battleships, 100 destroyers, 9,000 bombers, and 40,000 tanks! Money-wise, the loss was almost 4 *billion* dollars!

Where did these accidents happen? Two-thirds of them happened outside of industry. In the home, where workers take chances they would not dream of taking on the job. They happened in darkened hallways . . . in bath tubs . . . in garages and basements. They happened in industry where someone gambled with safety.

No matter what you do, your life is precious to this nation. Don't take chances with it. Guard it for America . . . at day . . . and at night. Fight carelessness, the Master Saboteur! Join the anti-accident crusade! Help save a life!

The perfection of the famous "Eveready" fresh DATED flashlight battery called for coordination between various Units of Union Carbide and Carbon Corporation. The exact grade of graphite necessary for the "mix" was developed by the Acheson Graphite Corporation. Special alloy for protecting molds and machinery was produced by the Haynes Stellite Company, and Carbide and Carbon Chemicals Corporation provided a specially prepared paint made of "Vinylite" resins for the spun metal cap.

"EVEREADY" FLASHLIGHTS AND BATTERIES

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The College

(*Continued from page* 26)

tions of the year 1941-42. THE CORNELL ENGINEER received four honorable mentions, these being awarded for the best campus news, best illustrations, best alumni section, and best cover. The magazine winning distinction for the best all-around Engineering College publication was the Iowa Engineer of the University of Iowa.

The reflection of the convention was that engineering college magazines shall continue to publish and that the training of engineering students is of utmost importance.

New Diesel Engine Laboratory

Diesel Commander

LIEUTENANT-COMMANDER Norman R. Sparks has reported for duty as head of the department of Diesel engineering in the U. S. Naval Training School at Cornell, succeeding Dr. Arthur S. Adams who has been ordered to Washington for special duty with the Navy Department.

Commander Sparks comes from Penn State College where he was officer in charge of the Naval Training School for the past 22 months. The program there is similar to that at Cornell. He is a native of Alameda, Calif., was graduated from the New Rochelle High School, and in 1923 received the degree of mechanical engineering from Clarkson College of Technology at Potsdam. He spent a year and a half with the New York Central Railroad as an apprentice in motive power before going to Penn State College in

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The College

(Continued from page 28)

1924 as instructor in mechanical engineering. He was appointed assistant professor in 1930, associate in 1933, and full professor in 1940. In January, 1941, he became officer in charge of the Naval Training School for Diesel engineering.

Gliders at Cornell

(Continued from page 9)

is low, it is impossible for the pilot to nose the ship over. If the stick is pushed forward during the run, the air force on the elevator will lift the tail, and the nose of the fuselage will skid on the ground which has a strong braking effect on the speed of the plane. This method of braking is applied at the end of the run after the pilot has pulled the release which detaches the tow rope of the tow car from the plane. The nose skid will scrape the ground and bring the trainer to a stop without the danger of nosing over. The pilot during the run is securely fastened in the cockpit by a safety belt, conforming to glider practice, which keeps him on the seat when the ship hits a bump.

After a few such runs, during which the pilot has had the use of the ailerons, rudder, and elevators separately, he is permitted to use all three controls simultaneously to acquire coordination of his control movements and keep the plane on a straight path. This is the essential phase of his training on the ground trainer. As in driving a car, the motions of steering the ground trainer along the desired path must become second nature. It is the purpose of the ground trainer to give the student a cerain degree of mechanical coordination of the controls of an airplane.

It is hoped that the glider ground trainer will fill a gap in the aviation training program of high schools, giving boys and girls a basic knowledge of the design features of aircraft by actually building and flying gliders. The practicability of the ground trainer is beyond question, and it was designed to be built of non-essential materials and affords a maximum factor of safety in its operation.

STRESS *and* STRAIN...

A certain brewer sent a sample of his beer to a lab to be analyzed. A few days later he received a report from the chemist—"Dear Sir, your horse has diabetes."

* * *

It was noticed that during a lecture given recently on this campus two empty seats got up and walked out.

* * *

The Queen Bee is a hardy soul.
She thumbs her nose at birth control.
This is the reason beyond a doubt
There's so many Sons of Bees about.

* * *

A Westerner upon receiving his order of roast beef in an eastern restaurant stared wide-eyed down at his plate exclaiming, "Gol' dern, I bin livin fer ninety-two years and never seen one hurt that bad."

Mother: "Johnny, I think it was so nice that you were playing marbles with your friend, George, this afternoon."

Johnny: "That wasn't marbles I was playing, mother. We just had a fight, and I was helping him pick up his teeth."

* * *

He: "Knowest thou how to bringge uppe thy childe?"

She: "Certainly."

He: "Then snappe to, for thy childe is at the bottom of yon cisterne.

* * *

She: "Life is just one damn thing after another."

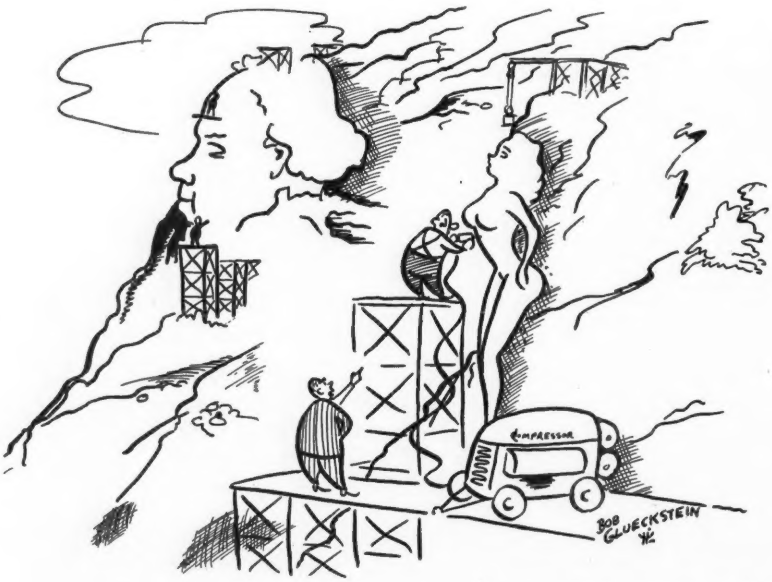
He: "Yes, and love is just two damn things after each other."

* * *

Pledge: "Do I have to eat this egg?"

Senior: "Yer damnright."

Pledge: "And the beak, too?"



—Courtesy Excavating Engineer

"See, here, Jones, let's stick to the main subject!"

Waiter: "May I help you with that soup?"

Diner: "What do you mean help me? I don't need any help."

Waiter: "Sorry sir, from the sound I thought you might wish to be dragged ashore."

* * *

First She: "Oh, Gilbert has the most powerful pair of binoculars."

Second She: "Good, I dearly love these strong, virile men."

* * *

A naive young lady was recently introduced to a tired, dejected Cadet. Wishing to start him talking, she asked him what he was taking up this year. He cryptically answered, "Space mostly."

* * *

Goebbels has demanded more babies for the Reich. But now that the Axis is admittedly having production trouble, the world tensely awaits the appearance of an ersatz product.

* * *

A gay fop from old Monticello
Is really a terrible fellow
In the midst of caresses
He fills ladies' dresses
With garter snakes, ice cubes, and jello.

* * *

Information Please: "Explain the tremendous increase in population after the Industrial Revolution."

Expert: "Everybody went to town."

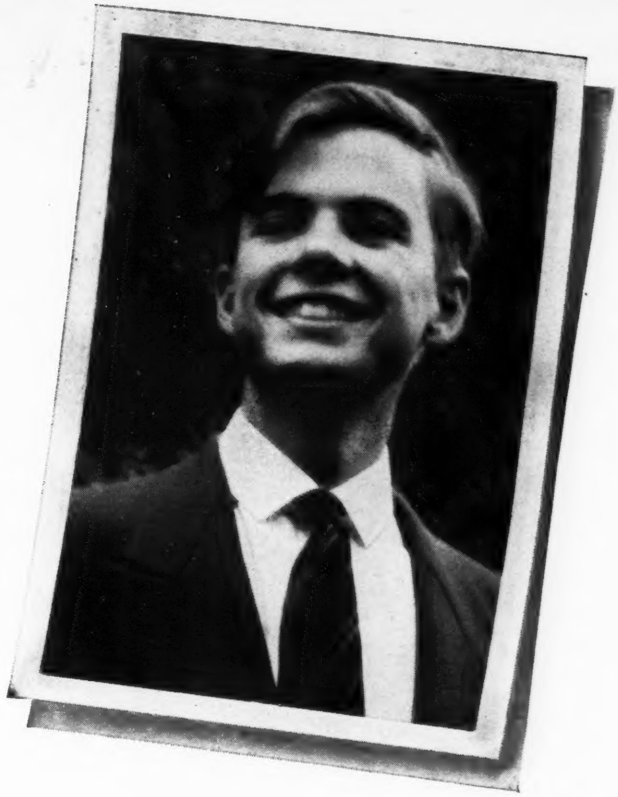
* * *

The little girl demurred at taking the dose of medicine which her parsimonious Dad offered.

"Come now, your old Dad spent his last dollar for this," he pleaded.

The child took the medicine, but a little later she sidled up to him and said, "Daddy, if you think you can afford it, I'd like to throw this."

Son...



HE has just turned eighteen. Shaves twice a week and maybe a hair or two is sprouting on his chest. He shies away now when his dad tries to be affectionate and we noticed some lipstick on one of his handkerchiefs after a country club junior dance not so long ago. But it seems only yesterday, perhaps it was the day before, that he was a chubby legged kid swinging from the arch of the doorway, leading to the dining room, in a gadget that was something like a breeches buoy and he was sucking at the end of a turkey bone.

He went back to school this Fall, a tall, athletic lad, budding into manhood, but there was something else on his mind beside the football and hockey teams or the little blonde girl with whom he had "palled" around during the Summer. It seems as though he was listening for a certain call—the Clarion call that poets sing about—and, perhaps we just imagined it, but we thought we saw an upward jutting of his chin, a certain light in his eyes, and a sort of a rearing-to-go expression in his face.

It chilled us a bit in the region of our heart, when we thought of his discarding the sports coat for the "O.D." of the Army or the blue of the Navy. There was a bit of a catch in our throat as we thought of his putting aside his football helmet for one of steel; of his hanging up his hockey stick and reaching for a gun. After all we still regard him as just a little boy.

They tell us that the eighteen and nineteen year old lads are to be called to the service. When that day comes to us there will be prayers, but no tears. We shall not mourn nor shall we be fearful. Rather there will come welling up from our hearts that warm feeling of pride that millions of other parents will sense when their beloved lads marched away. Our lad is no different than the others. We are no different than other loving parents, nor is our sacrifice any greater. They are going to make great soldiers, sailors, marines and fliers out of these youngsters. And they will become a mighty force when they take their places beside their brothers in arms. They too know what they fight for. They too know full well of the sacrifices that must be made before the evil powers that threaten the world can be overcome.

And let us not forget that they are counting on us. They know that we shall not fail them.

God be with them and their brothers.

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

REG. U. S. PAT. OFF.

G-E Campus News

THE HOME GUARD

A DEVICE which can be installed in the home to give both audible and visible warning of air raids has been developed by J. L. Woodworth (U. of Idaho, '24) in the G-E Carrier Current Laboratory.

Designed to operate on carrier current systems, the new gadget makes it possible to contact air raid wardens and civilian defense workers without increasing the load on telephone lines.

When the air raid signal is sent from the transmitter at the power station, the home warning device (which resembles an ordinary house meter) begins to buzz.

After it has thus called attention to itself, the device lights up, and on its dial will appear a colored signal—yellow for preliminary caution, blue for advance caution, red for air raid, or white for all clear—that corresponds to the signal sent from headquarters.

"VEE" JEWELS

THE General Electric Company has developed a method of fusing a special type of glass and forming a miniature jewel. How it's done is a military secret, but the jewels are made on a mass-production basis.

The jewels, called "Vee" jewels (not V for Victory, but "Vee" for the V-shaped depression in which a cone-shaped steel pivot rotates), are in great demand for use in the indicating instruments that measure the flow of electricity in wartime fighting and industrial control equipment. The moving parts of these instruments are of watch size and delicacy, each requiring two Vee-shaped jewels about the size of the head of a pin.

The G-E "gem" has been developed as a substitute for the "Vee" jewels made from sapphires formerly supplied by Swiss craftsmen.

YOUR SMOKE IS SHOWING

A TRAIL of smoke often leads enemy submarines to their intended victims, but an electronic tube might help to give the subs the slip by instantly warning the ship's fireman when smoke is coming from the vessel's stack.

General Electric has already put the phototube, most versatile of the electronic tubes, to work in industrial plants to warn of smoking stacks and to save fuel. W. C. White (Columbia, '12), director of the G-E electronics laboratory, thinks a similar arrangement might be used in ship stacks.

A beam of light, thrown across the smoke column in the chimney, shines on the tube. When the smoke gets too thick, the light is blocked and the phototube works a relay which sounds a warning for the fireman.

GENERAL ELECTRIC

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